



ILLINOIS DEPARTMENT OF
PUBLIC HEALTH

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1438050006 -- PEORIA COUNTY
MAPLETON/SHEREX CHEMICAL CO.
SUPERFUND/TECHNICAL REPORTS

John R. Lumpkin, M.D., Director

MEMORANDUM

TO: Robert O'Hara, Project Manager
IEPA-Land Pollution Control

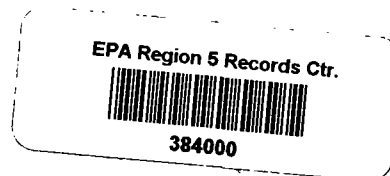
Tom Hornshaw, Ph.D.
IEPA-Office of Chemical Safety

FROM: Bruce C. Barrow *B.C.B.*
IDPH-Environmental Toxicology Program

RE: Health Assessment

Sherex Chemical Co. Inc.
Cerclis No. ILD095792859
Mapleton, Peoria County, Illinois
208278601H

DATE: April 18, 1991



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Enclosed is a copy of the Draft Health Assessment for the above-mentioned site prepared by this department and distributed to you for review and comments.

If your written comments are not received within 30 days, the draft copy will become final. If you have any questions, please feel free to call me at (217) 782-5830.

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APR 22 1991

IEPA/DLPC

HEALTH ASSESSMENT
SHEREX CHEMICAL COMPANY, INC.
WASTE DISPOSAL AREA

PEORIA COUNTY
MAPLETON, ILLINOIS
APRIL, 1991

Prepared by:
ILLINOIS DEPARTMENT OF PUBLIC HEALTH
Springfield, Illinois
#208278601H

SUMMARY

Sherex Chemical Company, Inc. is a State Remedial Action Priorities List site located just south of Mapleton, Illinois in Peoria County. During the 1960s and 1970s, approximately 25,000 to 30,000 gallons of cadmium-containing corrosive liquids generated during reactor cleaning operations, were disposed of in a shallow pit in the central portion of the Waste Disposal Area now owned by Sherex.

Because of past waste disposal practices, groundwater, soil, and sediment have been contaminated. Cadmium and trichloroethene are the predominant contaminants of concern. Both were found in the soil and groundwater and exceeded acceptable drinking water standards. This site is considered to be of limited public health concern under current conditions. Even though no human exposure pathway is presently considered complete at this time, the potential for human exposure to the contaminants of concern still exists and may be of health concern in the future.

BACKGROUND

A. SITE DESCRIPTION AND HISTORY

The Sherex Chemical Company, Inc. (Sherex) site was listed by the Illinois Environmental Protection Agency (IEPA) on the State Remedial Action Priorities List (SRAPL) in July of 1985. The Sherex property, consisting of approximately 389 acres, is located just south of Mapleton, Peoria County, Illinois and is approximately 20 miles southwest of the city of Peoria (Figures 1 and 2). It is bounded by the Illinois River on the south, the Lonza industrial property on the west and undeveloped industrial property on the east. The production facility is located on approximately 40 acres. Sherex's Waste Disposal Area (WDA), the area of contamination, consists of less than 10 acres. This area is situated just east of the production area and is mostly covered with vegetation. Surrounding the WDA on the south, north, and east is a surface water drainage ditch system. This ditch system leads to the Sherex ponds which are downgradient from the WDA. Several sets of railroad tracks run from east to west through the site (Figure 2).

Sherex produces fatty acids, unsaturated alcohols, and fatty nitrogens at the Mapleton plant. The plant uses tallow and/or tallow substitutes as the primary raw materials for the fats and oils needed to produce its manufactured products. The primary nitrogen chemicals include quaternary softeners, specialty quaternaries, petroleum additives, and mining chemicals.

The facility was built by Archer Daniels Midland (ADM) in 1962. In 1967, Ashland Chemical Company purchased the property from ADM. In 1978, Sherex purchased the property from Ashland.

During the 1960s and 1970s, approximately 25,000 to 30,000 gallons of cadmium-containing corrosive liquids generated from the cleaning of the high-pressure alcohol process reactor were disposed of in a shallow unlined pit in the central portion of the WDA. The copper-cadmium catalyst used in the reactor caused the buildup of material on the reactor walls. Thus, a periodic cleaning operation using nitric acid was needed. The spent acid wash was transferred to a tank wagon, transported to the WDA, and allowed to drain onto the ground in the pit. In 1966, a storage tank was installed next to the reactor to hold used nitric acid between cleanings. When the acid could no longer be reused, it was transferred from the holding tank and disposed of by draining into the WDA pit. The pit was also used during the early years of the plant to hold boiler fly ash.

The WDA was originally identified as a potential hazardous waste site through the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund) process. Sherex and Ashland submitted CERCLA 103C notification to the IEPA in June, 1981. The United States Environmental Protection Agency (USEPA) in turn performed a preliminary assessment/site inspection in September, 1981. No further action was taken until February, 1984 when the USEPA performed another site inspection to obtain information for the Hazard Ranking System (HRS) scoring. The HRS scoring performed in March, 1984 did not qualify the WDA as a Superfund site. In November, 1984 Sherex contracted with Whitney and Associates of Peoria, Illinois to perform a borehole evaluation in the vicinity of the WDA. Results of the soil samples indicated the presence of high cadmium levels concentrated near the bedrock. The area sampled, less than 1 acre, is shown in Figure 3. In July, 1985, the IEPA placed the WDA on the SRAPL list. The IEPA contracted with Envirodyne Engineers, Inc. to do a Remedial Investigation (RI) of the WDA site. The RI was completed in May, 1988.

B. SITE VISIT

A site visit was conducted by Illinois Department of Public Health (IDPH) staff on October 24, 1989. Information obtained during the site visit is incorporated into the Health Assessment (HA) text. It was noted that site and plant facilities were completely enclosed with high hurricane fencing. Since the plant is presently in operation, entrance to the plant is controlled. The WDA appeared to be well capped and covered with thick grass. No employees were observed in the WDA area during the visit.

DEMOGRAPHICS, LAND USE, AND NATURAL RESOURCE USE

The WDA site is bounded by the Illinois River on the south, the Lonza industrial property on the west and undeveloped industrial property on the east. Lonza produces the same type of products as Sherex. Directly north of the WDA is highway U.S. 24. Mapleton, population approximately 200, is directly north of U.S. 24 and about 1500 feet northwest of the WDA site (Figure 2). The Mapleton residents are upgradient of the WDA and the closest residents to the site. There are no residents or populations in the southeast direction (downgradient) between the WDA and the Illinois River. The population at greatest risk to exposure is the approximately 350 Sherex employees. No sensitive subpopulations could be identified near the WDA site.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

A. ON-SITE CONTAMINATION

A limited number of compounds were found at concentrations higher than background levels. These compounds and the affected media included: trichloroethene, a number of unknown semi-volatile compounds, cadmium, and copper in the soil samples; trichloroethene, a number of unknown semi-volatile compounds, cadmium, manganese, and nickel in groundwater samples; and some unknown semi-volatile compounds and manganese in sediment samples (Tables 1 and 2).

1. Soil

All soil samples were taken from the B (Borehole) locations shown in Figure 4. Cadmium, copper, and manganese were found at elevated concentrations in a number of soil samples when compared to the average concentration considered background (Borehole B-1). Only cadmium and copper were detected at levels several orders of magnitude higher than the background.

Using Resource Conservation and Recovery Act (RCRA) regulations, cadmium was found to exceed the 1.0 milligram per liter (mg/L) level (the level at which it would be considered a hazardous waste) in 2 of 85 soil samples. A concentration of 2.7 mg/L was found at the shale interface (about 21.5 feet below ground) in the Borehole B-7 sample and a 1.39 mg/L concentration was found in the Borehole B-9 sample (about 20 feet below ground).

Trichloroethene (TCE) was the only volatile organic compound found at a level considerably higher than the detection limit of 5 micrograms per kilogram (ug/kg). A maximum TCE concentration of 1,390 ug/kg was found in a soil sample from a 12-foot depth in Borehole 7.

2. Groundwater

Groundwater samples were collected in October, 1987 from the five monitor wells installed on-site during the RI (Figure 4). Only one sample (sample G104) indicated a concentration of cadmium [0.012 mg/L] which was slightly higher than the promulgated maximum contaminant level standard (MCL) of 0.01 mg/L. From the second round of well sampling a month later, a sample from the same well indicated 0.007 mg/L of cadmium. A third-round sample (July 27, 1988) from well G104 indicated 0.0098 mg/L of cadmium. Three subsequent samples from this well have all tested at or below the 0.005 mg/L detection limit for cadmium. The dates of these samples were: November 17, 1988; May 5, 1989; and August 10, 1989. TCE was the only organic contaminant found to exceed acceptable drinking water standards and it was not found until the second round of monitor well sampling (November 24, 1987). It was found in well G104 at a concentration of 0.008 mg/L. The MCL for this parameter is 0.005 mg/L. Subsequent sampling of the same well revealed the following concentrations of TCE: July 27, 1988, 0.013 mg/L; November 17, 1988, 0.005 mg/L; August 10, 1989, 0.028 mg/L. This may indicate a migration of TCE contaminant from the WDA. The highest concentration of manganese (0.20 mg/L in November, 1987) was detected in well G105. The Illinois General Use Standard of 1.0 mg/L was not exceeded. The highest concentration of nickel was also detected in well G105 at a level one order of magnitude higher than the background level.

B. OFF-SITE CONTAMINATION

The only off-site testing for contaminants was the collection of four sediment samples from the drainage ditches adjacent to the WDA (Figure 4). The results for organic compounds revealed a number of unknown semi-volatile hydrocarbons and acids. Additionally, a number of inorganic constituents were detected, but only manganese was above the background value.

C. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

According to the RI, the data contained therein has undergone QA/QC review. The conclusions contained in this HA are based on a site visit and the investigations and data available. The accuracy of these conclusions is determined largely by the availability and reliability of the data reviewed.

D. PHYSICAL AND OTHER HAZARDS

There are no visible physical hazards at the WDA. The site is well capped and entrance into the site is controlled as part of the present operation policy of the Sherex plant.

PATHWAYS ANALYSES

A. ENVIRONMENTAL PATHWAYS

1. Soil

The majority of the soil contamination is subsurface contamination due to past waste-disposal practices. Contaminant location, combined with the inaccessibility of the site, and good ground cover, are reasons exposure via this medium is considered minimal and not a pathway of concern.

2. Groundwater

The general direction of the groundwater flow was determined to be east-southeast following bedrock topographic contours toward the Illinois River. With the highest concentrations of cadmium generally found just above the top of the bedrock and four commercial (industrial) supply wells downgradient (Figure 5), the groundwater becomes a pathway of concern. Also of concern is the possible migration of TCE off-site via the groundwater. Groundwater flow rates on-site were determined to be between 0.3 to 8.8 feet per day. However, only one downgradient well (G104) had a concentration of TCE and cadmium above drinking water standards. The Illinois River would act as a natural barrier to contaminant migration to drinking water wells on the eastern side of the river. The river may be another environmental pathway.

With the extent of fracturing within the bedrock not being fully evaluated, there is a concern of possible downward migration of the cadmium and TCE. It should be noted that Mapleton has a free-flowing public water supply well (1641 feet deep) which taps a deep bedrock aquifer (not the shallow, contaminated aquifer).

3. Sediment

Only four sediment samples were collected from the extensive drainage ditch system around the perimeter of the WDA (Figure 4). Low levels of a number of unknown semi-volatile hydrocarbons and organic acids were detected and may be indicative of discharges to the ditches from upstream process sources within the Sherex plant. The only inorganic that was detected in the limited sampling, that was above the background level, was manganese (Table 2). The ditches could be a source of contamination. More sampling is needed to determine that possibility.

4. Surface Water

No surface water samples were taken from the surface drainage ditch system surrounding the site or the Sherex ponds adjacent

to the site. These ponds may contribute to groundwater contamination. Sampling of these ponds is needed in order to make this determination. The WDA site is close enough (about one-half mile) to the Illinois River to be a discharge area. However, even should the groundwater discharge into the river, the large dilution factor should significantly reduce contaminant levels.

5. Air

No air monitoring surveys were conducted. The good ground cover and the present location of the contaminants are reasons exposure via this medium is considered minimal and not a pathway of concern.

6. Biota

Release of cadmium from the site may pose potential risks to aquatic biota because of its tendency to bioaccumulate in aquatic species. Possible release of TCE by groundwater discharge into the Illinois River is of minimal concern because of its low bioaccumulation potential in fish and its rapid volatilization when present in surface water. During the RI, the IEPA's Division of Water Pollution Control was contacted concerning their "Fish Contaminant Monitoring Program" to obtain any available data. Fish monitoring data were obtained at the two Illinois River stations closest to the site (upstream and downstream). However, no data were available on the cadmium concentrations in fish tested at those stations. The sampling of fish from the portion of the Illinois River closest to the site is needed to determine possible cadmium contamination.

B. HUMAN EXPOSURE PATHWAYS

Cadmium contamination is located primarily in the shallow (20 to 25 feet deep) groundwater aquifer zone. There are four commercial (industrial) supply wells in potential receptor range of a contaminant plume generated from the WDA. These commercial supply wells are all owned by Sherex and located several thousand feet down gradient of the WDA site (Figure 6). They draw water from the same shallow aquifer as the monitor wells surrounding the WDA site. The Sherex employees could be exposed to the contamination via ingestion of the well water. Sampling results from monitor well G104 seem to indicate the possible migration of TCE. If the TCE migrates into the Sherex water supply wells, employees using the water for purposes other than drinking (such as washing or showering) could be exposed by inhalation and dermal contact with TCE. However, these exposures to TCE are unlikely due to the Sherex water treatment system which is capable of removing TCE contaminants. Exposure to cadmium by ingestion of well water would be a concern. However, Sherex does not use the water from its wells for drinking. Instead, employees use bottled water for drinking.

Also, there is a potential for possible human exposure to cadmium (with its bioaccumulative characteristics) through the ingestion of fish or other aquatic life from the Illinois River.

Exposures by incidental ingestion, inhalation of contaminated fugitive dust and direct dermal contact with contaminated soil are deemed minimal due to the present grass cover, inaccessibility of the site, and present location (near the bedrock) of the majority of the TCE and cadmium.

PUBLIC HEALTH IMPLICATIONS

As a result of past industrial operations and disposal practices, cadmium was the most commonly found and widely dispersed contaminant within the environmental media of the WDA.

Cadmium is a highly toxic element capable of producing a broad range of systemic effects, particularly to the respiratory, renal, and reproductive systems. It is also a teratogen in animal studies and there is evidence for carcinogenicity in humans via the inhalation route as well. Cadmium can accumulate extensively in exposed individuals and in populations through food chain magnification of residues. The cadmium concentration found in the groundwater on the WDA site was near the current primary drinking water standard of the National Primary Drinking Water Regulations (see ON-SITE CONTAMINATION section). Possible human ingestion of cadmium is of concern because of its potential for causing damage to the kidneys. The chronic ingestion of cadmium leads to its accumulation in the kidneys. When the cadmium concentration in the kidneys exceeds 200 micrograms per gram, damage to the renal proximal tubules may result giving rise to problems such as failure of the kidneys to excrete metabolic products. Other points of attack may be the prostate and blood. In addition, it has been suggested that cadmium may contribute to hypertension in man. However, epidemiological and experimental studies have not provided unequivocal evidence for such an effect.

The other groundwater contaminant of concern besides cadmium is TCE (see ON-SITE CONTAMINATION section). Data from the RI sampling and subsequent rounds of sampling of groundwater from monitor well G104 seem to indicate the possible migration of TCE off-site. A potential health concern would exist if the groundwater was used for human consumption. TCE is readily absorbed into the body via ingestion and inhalation. Elimination is slow. TCE also distributes to fat. Primary targets for TCE are the central nervous system, liver, kidney and hematological system. Because of positive animal studies, TCE is considered a probable human carcinogen.

Another contaminant which exceeded acceptable drinking water standards was manganese. However, the standard for manganese is a secondary standard which is based on aesthetic concerns (e.g. color, and odor) and does not represent a health hazard.

Since the groundwater flow is east-southeast from the WDA, the only downgradient wells within potential receptor range of the contaminant plume are those belonging to Sherex. Since Sherex does not use any water from its wells for drinking, there is no known human exposure by ingestion of the groundwater. This pathway is therefore considered non-functional and not a present health concern. Because Sherex has a water treatment system capable of removing TCE, the exposure of Sherex employees by inhalation and dermal contact during washing and showering is not a concern. As a non-transient/non-community public water supply, water from the Sherex water treatment system is tested quarterly and the results are sent to the IDPH for verification.

No testing of fish or other aquatic animals for cadmium has been performed in the portion of the Illinois River near the site. Without such testing information, no determination of possible adverse human health effects can be made on this ingestion pathway. However, if groundwater contamination were to reach the Illinois River, the large dilution factor and the high mobility of the fish should minimize the contamination.

The inaccessibility of the site, the location of the majority of the contamination, the site cap and ground cover limit the possible exposure by accidental ingestion, inhalation, or direct dermal contact pathways to possible on-site or off-site receptors.

CONCLUSIONS

Based on information available, it is concluded that the Sherex WDA site is of limited public health concern under current conditions. As noted in the Human Exposure Pathways section of this report, there are no human exposure pathways considered complete, at this time. However, the potential for human exposure to the contaminants of concern still exists and may be of health concern in the future.

RECOMMENDATIONS

Groundwater monitoring should continue for the potential receptor supply wells and the on-site monitor well system. Assurance is needed that contaminant levels are not increasing. Also, the testing of fish in the site area of the Illinois River

for cadmium is recommended. A complete evaluation of the Sherex ponds and surface water drainage system should be performed to determine if these may be additional sources of groundwater contamination. When more information and data become available, such material will form the basis for further assessment by the IDPH at a later date.

PREPARER AND REVIEWER OF THE REPORT

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REFERENCES

ATSDR (Agency of Toxic Substances and Disease Registry). Toxicological Profile for Cadmium (Final), Atlanta, Georgia, 1989.

ATSDR (Agency for Toxic Substances and Disease Registry). Toxicological Profile for Trichloroethylene (Final), Atlanta, Georgia. 1988.

Envirodyne Engineers, Inc. Final Remedial Investigation Report on the Waste Disposal Area of Sherex Chemical Company, Inc. Mapleton, Illinois. May, 1988.

Sittig, M. Handbook of Toxic and Hazardous Chemicals and Carcinogens, Park Ridge, New Jersey. Noyes Publications. 1985.

USEPA (U.S. Environmental Protection Agency). Office of Drinking Water. Health Advisory for Trichloroethylene, Washington D.C. March 31, 1987.